



GB04/04788



INVESTOR IN PEOPLE

The Patent Office
Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

REC'D 28 DEC 2004

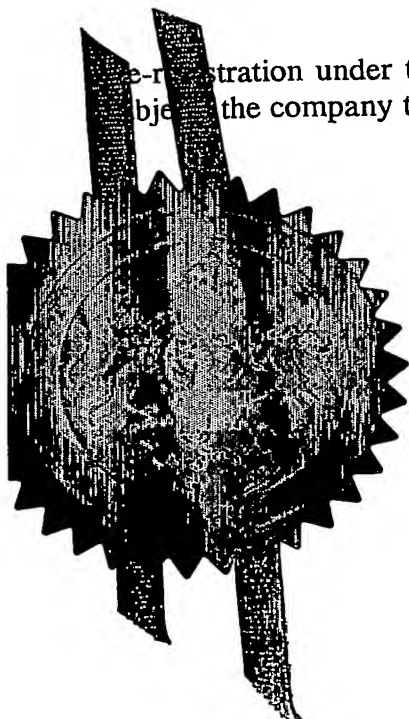
WIPO PCT

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.



Signed

W. Evans

Dated

25 November 2004

**PRIORITY
DOCUMENT**

SUBMITTED OR TRANSMITTED IN
COMPLIANCE WITH RULE 17.1(a) OR (b)

BEST AVAILABLE COPY

17NOV03 E852530-1 D02846
P01/7700 0.00-0326659.0

The Patent Office
Cardiff Road
Newport
NP9 1RH

Patents Form 1/77

THE PATENT OFFICE
SN

1 5 NOV 2003

NEWPORT

Request for grant of a patent

1. Your Reference **PLB/SIS/Y1904**

2. Application number **0326659.0**

15 NOV 2003

3. Full name, address and postcode
of the or each Applicant

**InteliSYS Ltd
Campus Ventures Centre
Oxford Road
Manchester
M13 9PL**

Country/state of incorporation
(if applicable)

8753949001

Incorporated in: England & Wales

4. Title of the invention

FLUID MONITORING APPARATUS

5. Name of agent

APPLEYARD LEES

Address for service in the UK to
which all correspondence should
be sent

**15 CLARE ROAD
HALIFAX
HX1 2HY**

Patents ADP number

190001

6. Priority claimed to:

Country

Application number

Date of filing

7. Divisional status claimed from:

Number of parent application

Date of filing

8. Is a statement of inventorship and
of right to grant a patent required in
support of this application?

YES

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form

Description

8

Claim(s)

Abstract

Drawing(s)

3 + 35N

10. If you are also filing any of the following, state how many against each item

Priority documents

Translation of priority documents

Statement of inventorship and right to grant a patent (PF 7/77)

Request for a preliminary examination and search (PF 9/77)

Request for substantive examination (PF 10/77)

Any other documents (please specify)

11.

We request the grant of a patent on the basis of this application.

Signature

Date

APPLEYARD LEES

14 November 2003

Appleyard Lees

12. Contact

Paul Brandon - 0161 835 9655

FLUID MONITORING APPARATUS

Field of the Invention

5 The present invention relates to fluid monitoring apparatus and particularly, though not exclusively, to mains water monitoring apparatus. The present invention also relates to fluid mains, especially but not exclusively water mains, to which such an apparatus is
10 coupled.

Background to the Invention

Mains water supplies need to be monitored for the
15 well-being of the populous and to assist in the maintenance and upkeep of those supplies. Monitoring of such supplies up to now has been carried out by local inspection. A human operative will visit a mains hydrant, gaining access thereto by a culvert or the like, collect a
20 sample of mains water from the hydrant branch and move on, returning periodically.

This has several disadvantages. It is intensive in terms of skilled manpower requirements and only tests water in
25 the hydrant branch. Further, for many forms of monitoring water needs to be removed from the location for testing as a result of which its properties may change.

It is an aim of preferred embodiments of the present
30 invention to obviate or overcome a disadvantage of the prior art, whether such disadvantage or prior art is referred to herein or otherwise.

Summary of the Invention

According to the present invention in a first aspect, there is provided a fluid monitoring apparatus for monitoring a fluid in a fluid mains supply, the apparatus comprising means for connecting the apparatus to the mains supply, a testing chamber, a fluid tester, testing a variable of a fluid in the testing chamber and a purger for purging a volume of fluid from the testing chamber which volume of fluid is substantially larger than the volume of the testing chamber, thereby replacing the fluid in the testing chamber with a new fluid volume.

Thus fresh fluid can be tested.

Suitably, the apparatus is suitable for coupling to a hydrant connected to the mains supply.

Suitably, the apparatus comprises a purge controller for controlling the purger to determine the volume to be purged. Suitably, the apparatus comprises a pressure sensor for measuring the fluid pressure. Suitably, the purge controller uses the measured pressure to determine the period for which the purger should operate. Suitably, the period is determined by comparing the pressure in a look-up table for a suitable purge time. Suitably, the purge controller comprises a microprocessor.

Suitably, the purger acts for a purge time such that the fluid from the mains supply enters the testing chamber.

Suitably, the fluid tester comprises a turbidity tester. Suitably, the apparatus comprises an electrical

conductivity tester. Suitably, the apparatus comprises a temperature tester.

Suitably, purged fluid is purged from the apparatus to
5 atmosphere.

Suitably, the apparatus comprises a memory for storing fluid test information. Suitably, the apparatus comprises means to enable data from the memory to be downloaded to
10 an external device.

Suitably, the apparatus comprises a power cell.

Suitably, the fluid comprises a liquid. Suitably, the
15 liquid comprises water.

Suitably, the mains supply is a mains water supply.

According to the present invention in a second aspect,
20 there is provided a fluid mains to which an apparatus according to the first aspect of the present invention is coupled.

Suitably, the fluid mains is a liquid mains.
25

Suitably, the liquid mains is a water mains.

Brief Description of the Drawings

30 The present invention will now be described, by way of example only, with reference to the drawings that follow; in which:

Figure 1 is a perspective illustration of an apparatus according to the present invention attached to a hydrant.

Figure 2 is a schematic cross sectional elevation of the
5 apparatus shown in Figure 1.

Figure 3 is a schematic perspective view of a turbidity sensor for use in the apparatus show in the preceding figures.

10

Description of the Preferred Embodiments

Referring to figures 1 and 2 of the drawings that follows, there is shown a mains water supply 2 (as an example of a
15 fluid mains) from which extends a hydrant branch 4 to a hydrant 6. The hydrant branch 4 can be up to one metre long in practice (though the present invention is not limited to this or any other length).

20 Coupled to and mounted on the hydrant 4 is a fluid monitoring apparatus 8 according to a preferred embodiment of the present invention. In this case, the fluid monitoring apparatus is a water monitoring apparatus. The monitoring apparatus 8 is attached to the hydrant stand-
25 pipe screw thread (not shown) by connection means comprising a thread attachment (indicated schematically at 10), which is secured to a case 12 of the apparatus 8 closed with a lid 14. The lid 14 is secured to the case by an attachment nut 16. Extending from the thread
30 attachment and partially into the branch 4 is a sensor head 18 defining therein a testing chamber 20 into which water from the mains 2 flows. For the purpose of the

present invention the hydrant branch 4 extends from the mains supply 2 to the entrance to the testing chamber 20.

5 The sensor head 18 carries turbidity, electrical conductivity and temperature sensors 20, 22, 24 respectively. These are fluid testers.

Referring to Figure 3 of the drawings that follow, turbidity sensor 20 measures turbidity by using a
10 nephelometric turbidity cell 40, which measures scattered light at 90° to the emitter with the intensity of the reflected light being proportional to the concentration of particles within the sample. An infra-red light emitting diode (not shown) is mounted behind one of the sapphire
15 glass windows 42, 44 and a corresponding detector (not shown) behind the other window 44, 42. This allows, a resolution and accuracy at the lower end of the scale (0-10 Nephelometric Turbidity Unit (NTU)).

20 Electrical conductivity is measured to indicate the presence or absence of salts, and is often used as a surrogate measure for the dissolved load within a solution. The electrical conductivity sensor 22 (see also Figure 3) uses four-pole probes giving a linear output
25 allowing for easier calibration. To some extent, such a sensor self-compensates for algal and particle fouling on the plates ensuring a low drift. For instance this can be a K25 sensor from Sentek Ltd, Braintree, Essex, United Kingdom.

30

The temperature sensor 24 is a high accuracy thermistor encapsulated within the electrical conductivity sensor 20.

From the sensor head 18 a fluid flow path 28 is defined to an outlet 30. In a branch of the main fluid flow path 28 there is located a pressure sensor 32. Part of the flow path is defined by a solenoid valve 34 and another part by a non-return valve 36 before the outlet 30. The outlet 30 opens to atmosphere.

The apparatus further comprises a battery powered cell 38 for powering the apparatus 8.

Also provided is a microprocessor controller 40 and associated memory 42, which controller 40 receives signals from the sensors 20, 22, 24, and controls the solenoid valve 34.

Referring in particular to Figure 2, it is noted that in the branch 4 and the fluid flow path 28 of the apparatus 8 there is a substantial volume of water. In practice this water may not have the same characteristics as the water in the mains supply.

A mode of operation of this embodiment of the present invention will not be described.

Controller 40 controls the apparatus 8 to sample the water in the mains supply 2 periodically, say daily. Apart from when carrying out fluid monitoring the apparatus 8 is dormant and has no material effect on the mains supply 2. When the controller 40 determines a test is to be carried out to monitor the water it receives a signal from the pressure sensor 32 indicative of the water pressure and from a look-up table stored in memory 42 determines a time for which the solenoid valve 34 needs to be open in order

to purge sufficient water through the apparatus 8 so that the water in the sensor head 18 is mains water. Thus the solenoid valve 34 acts as a purger and controller 40 as a purge controller. That is, all of the water from the testing chamber 20 back to the water mains 2 has to be purged. The actual purge time required based on the current pressure can be determined empirically.

The controller 40 then controls the solenoid valve 34 to be opened for the period determined from the look-up table thereby to purge water through the apparatus 8 to atmosphere via the outlet 30. The solenoid valve 34 is then closed and readings are taken of turbidity, electrical conductivity and temperature from the respective sensors 20, 22, 24. These are then stored in the memory 42 associated with the microprocessor controller 40.

To download information from the microprocessor 40, a data outlet (not shown) can be provided or the apparatus can be BLUETOOTH enabled. In either case the data can be collected by an unskilled operative using a Personal Digital Assistant (PDA) or other data logging device. Modem and radio links can also be used.

The apparatus described herein can be used as a fluid testing apparatus, but is of particular benefit for liquids, especially water.

Attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this

specification, and the contents of all such papers and documents are incorporated herein by reference.

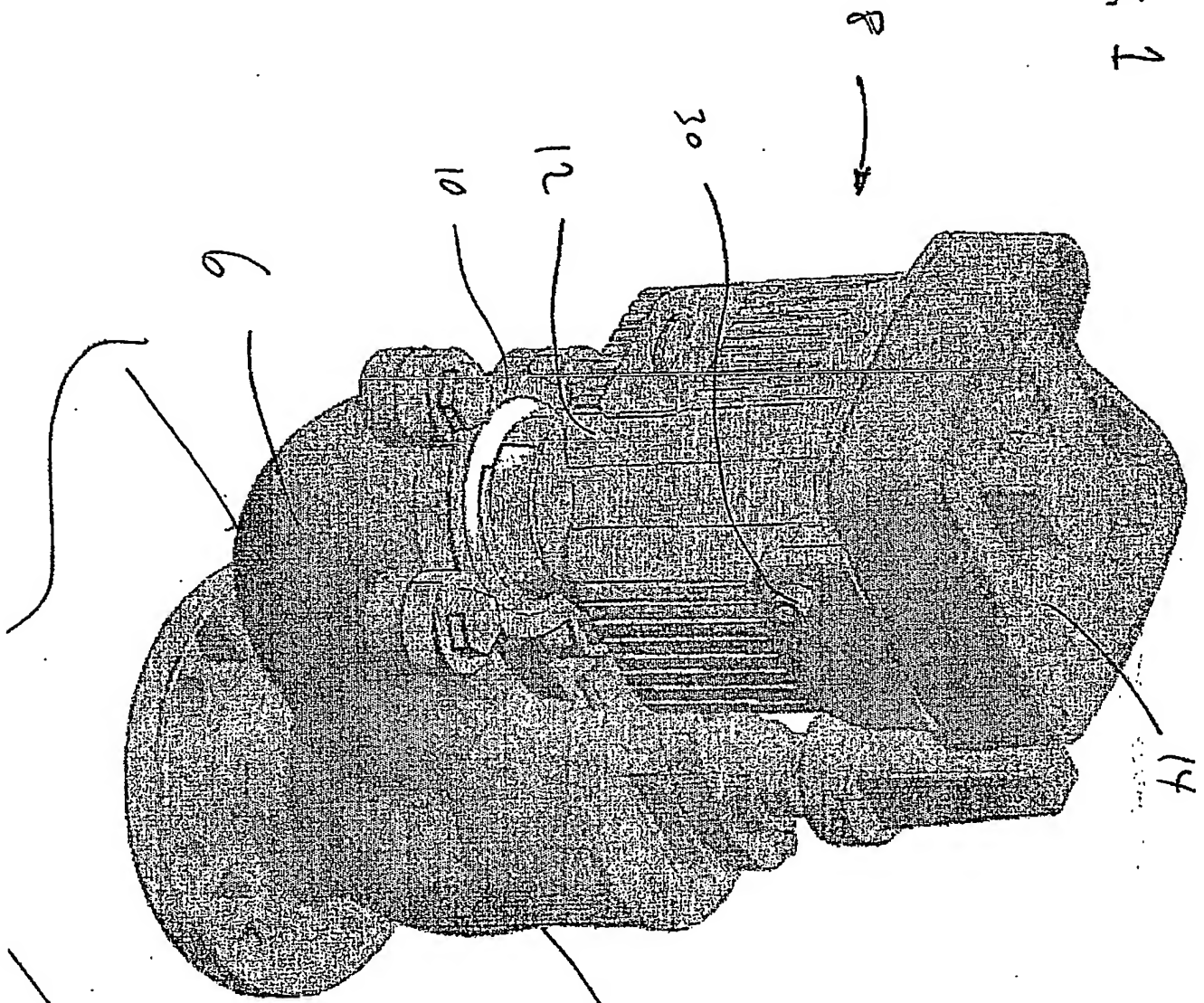
5 All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

10

Each feature disclosed in this specification (including any accompanying claims, abstract and drawings) may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each
15 feature disclosed is one example only of a generic series of equivalent or similar features.

The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any
20 novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any
25 method or process so disclosed.

Fig 1

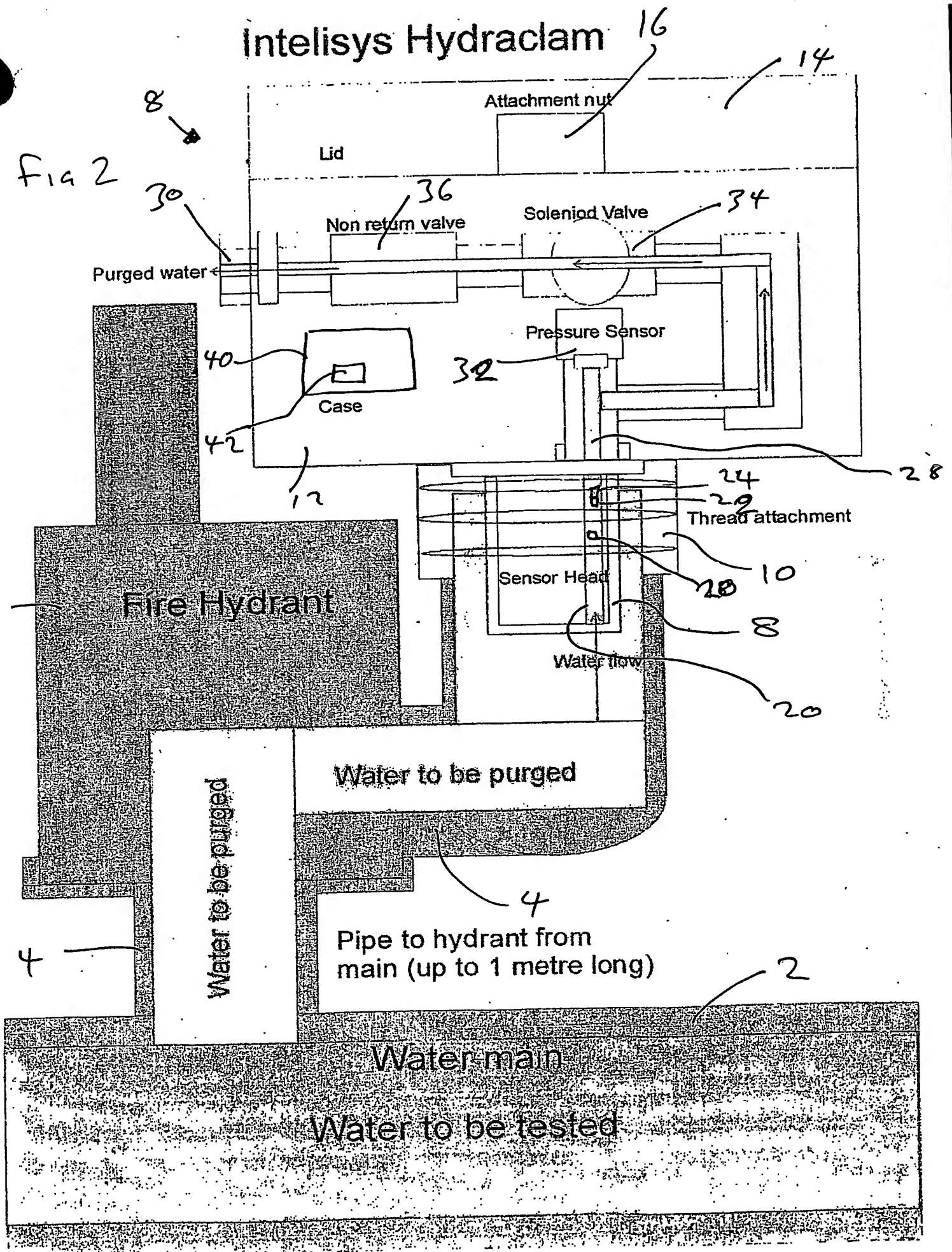


Hydraulic
motor

2

Intelisys Hydraclam

FIG 2



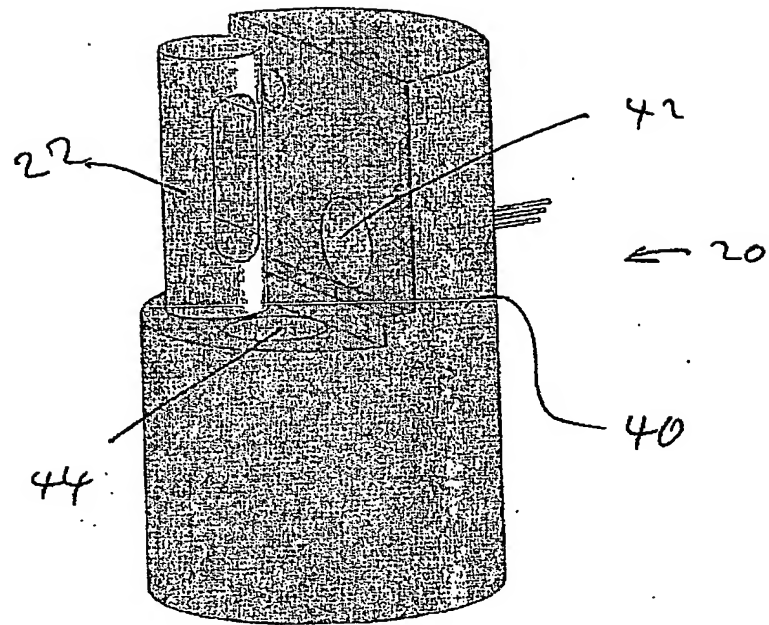


FIG 3

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record.**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☒ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☒ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER: _____**

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.